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About the Cover:

Family vehicles in the U.S. consume enough fuel each year to cover a regulation-size football field to a depth of about 40 miles. FETC partners with industry and other organizations to develop and deploy ultra-clean, high-performance fuels, ensuring that we can continue to depend on our transportation-based economy to bolster our transportation-based lifestyle.



Joseph P. Parise
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Swords to Plowshares

The atomic bomb, the hydrogen bomb, Hiroshima, the Cold War, the Iron Curtain, the Berlin Wall...the 50-year nuclear age left us with many indelible images.

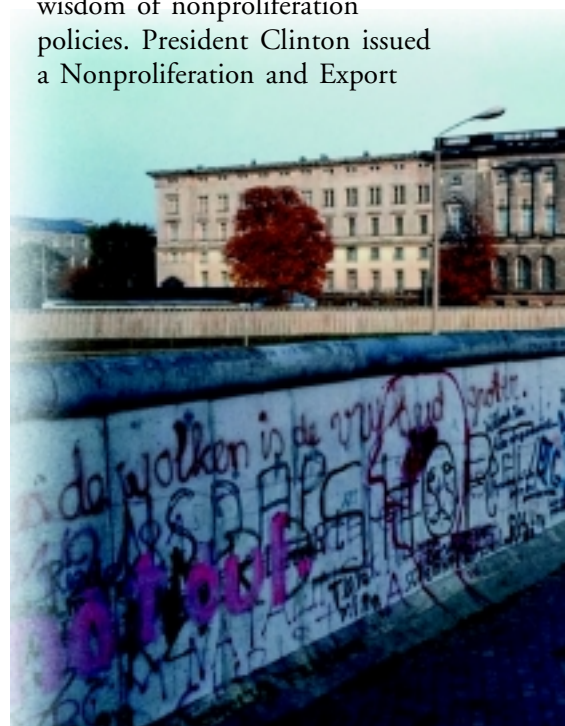
In 1943, the U.S. Department of Energy opened its Los Alamos National Laboratory and began to develop the first atomic weapons from uranium. Later, scientists took grams of a silvery, brittle, very dense radioactive heavy metal called plutonium and forged it into hydrogen weapons of mass destruction. When the U.S. adversary—then the Soviet Union—demonstrated its ability to harness the heavy metal, the world at large developed a collective angst over the possibility that the metal, in its most destructive form, could be unleashed.

Following significant changes in the political climate, not the least of which was the fragmentation of the Soviet Union into individual republics, the world's nations entered a new post-Cold-War era. During this era, both the U.S. and Russia had weapons-grade fissile materials, such as plutonium, that were considered surplus to their respective national defenses. A new fear surfaced. The National Academy of Sciences—in the report, *Management and Disposition of Excess Weapons Plutonium*—characterized the threat of nuclear weapons or materials falling into the hands of terrorists or non-nuclear nations through theft or diversion as a “clear and present danger.”

To deal with this clear and present danger, the U.S. in 1993 established a framework to prevent the proliferation of weapons of mass destruction. As part of the overall nonproliferation effort, DOE pursued activities to “make surplus weapons-usable plutonium inaccessible and unattractive for weapons use.” FETC helped prepare an environmental impact statement and several environmental assessments as part of DOE’s overall plutonium disposition strategy. The strategy outlined in the environmental impact statement permits two disposition actions: immobilization (safe burial) of plutonium, and conversion of surplus plutonium into a fuel for use in some U.S. nuclear reactors.

Nonproliferation and DOE’s Role

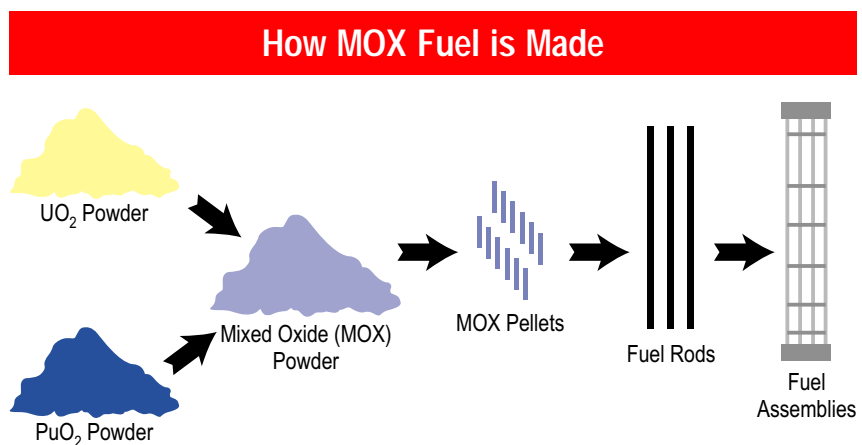
U.S. and Russian leaders saw the wisdom of nonproliferation policies. President Clinton issued a Nonproliferation and Export



Control Policy in 1993 and, in the following year, the President and Russian President Yeltsin issued a *Joint Statement Between the United States and Russia on Nonproliferation of Weapons of Mass Destruction and the Means of Their Delivery*. The 1968 Nuclear Nonproliferation Treaty requires that the nuclear powers—the U.S., Russia, China, France, and Britain—stop the spread of nuclear know-how to other countries.

The reasons for keeping nuclear technology out of the wrong hands is clear. In a story about emerging nuclear powers, ABC News reported that only 8 kilograms of plutonium is needed to build a bomb the size of the one that destroyed Nagasaki. And ABC further reported that a number of so-called “rogue nations”—Iraq, North Korea, Iran, and Libya—were searching for nuclear weapons despite the threat of international sanctions.

In accordance with the new policies, U.S. nonproliferation activities are focusing on the safe, secure, long-term storage and disposition of surplus weapons-grade fissile plutonium. The disposition strategy proposed in the environmental impact state-



ment places the U.S. in a strong position to negotiate on bilateral and multilateral inventory reduction of these materials.

For its part, the U.S. initiated disposition plans for about 50 metric tons of excess plutonium existing at Los Alamos in New Mexico and five other DOE sites: the Hanford Site near Richland, Washington; the Idaho National Engineering and Environmental Laboratory near Idaho Falls, Idaho; the Pantex Plant near Amarillo, Texas; the Rocky Flats Environmental Technology Site near Golden, Colorado; and the Savannah River Site near Aiken, South Carolina.

DOE, through its Office of Fissile Materials Disposition, initiated disposition plans for the excess plutonium by fabricating about 33 metric tons into a nuclear fuel called mixed oxide (MOX), a blend of uranium dioxide and

plutonium dioxide that is made into fuel assemblies suitable for use in some existing reactors at commercial nuclear power plants. The remaining 17 tons would be disposed of through a process called immobilization, whereby the plutonium is bonded with other materials and is eventually buried in a safe geological repository.

To fabricate MOX, a series of complicated steps transforms uranium dioxide and plutonium dioxide into a powder, which is then made into pellets for loading into empty fuel rods. The rods are subsequently bundled together to form fuel assemblies that meet all regulations. Although no new nuclear plants are currently being built in the U.S., several existing plants are planning to seek license modifications to use MOX nuclear fuel rods to make electricity.

To put plutonium’s energy-producing power in perspective, one gram (about the weight of a pencil eraser) of plutonium contains more energy than two tons of coal or one ton of crude oil.

Secretary's Statements on Plutonium

U.S. Energy Secretary Bill Richardson announced earlier this year that DOE had selected a team of companies to provide

The Cold War legacy: walls to tear down and weapons to dismantle.



MOX fuel fabrication and reactor irradiation services, supporting the DOE mission to dispose of excess plutonium. In conjunction with that decision, the Secretary also identified DOE's Savannah River site as the preferred location for a new fuel fabrication facility.

In terms of these kinds of efforts, Secretary Richardson said: *It is critical that the United States and Russia dispose of surplus weapons-grade plutonium so that it will never again be used in nuclear weapons. This partnership with private sector companies sets the stage for Russia and the United States to work together to eliminate tons of excess plutonium.*

A little more than 100 miles southwest of Moscow, a facility that opened in 1998 reflects cooperative efforts in nonproliferation. There, a ceremony heralded the startup of the Russian Methodological and Training Center, a cooperative effort between Russia, the U.S., and the European community to establish an academy to cover the areas of nuclear material protection, control, and accounting. At the same time, DOE announced that it had completed upgrades to security systems in areas containing weapons-grade material at Russia's State Research Institute and the Krylov Shipbuilding Institute.

FETC's Nuclear Mission


FETC, which historically has had a fossil energy research and development mission, broadened its mission in 1998 to address a wide range of energy and environmental issues. We saw an opportunity within the DOE plutonium

disposition initiative to use our environmental and technical expertise to support this initiative, and to expand our environmental portfolio base within DOE, all within the requirements of the National Environmental Policy Act. In accepting the challenge, FETC began providing technical support in 1995 to DOE's Office of Fissile Materials Disposition, the office responsible for the disposition effort.

Joseph P. Parise, who serves as FETC's Nuclear and Strategic Systems Product Manager, said: *FETC's mission is to solve nationally significant energy and environmental problems. As such, FETC, in support of the Office of Fissile Materials Disposition, is contributing to the solution of the globally significant problem of making weapons-grade plutonium inaccessible for weapons use.*

FETC has supported disposition activities in both Russia and the U.S. In one of its earliest activities, FETC supported efforts to help evaluate Russian engineering related to the feasibility of that country building a MOX-producing plant. Among a number of activities in the U.S., FETC focused its effort on the preparation of an environmental impact statement. The statement's strategy allows for immobilization of plutonium, use of MOX, and safe storage of plutonium in ceramic or glass containers. These efforts also include the siting, construction, operation, and eventually the decontamination and decommissioning of three facilities: a pit disassembly and conversion facility, a plutonium conversion and immobilization facility, and a MOX fuel fabrication facility.

The **pit disassembly and conversion facility** would disassemble pits (a type of weapons component) and convert the recovered plutonium, as well as other plutonium metals, into plutonium dioxide suitable for disposition. The **plutonium conversion and immobilization facility** would immobilize surplus plutonium for later disposal in a geological repository. And, the **MOX fuel fabrication facility** would fabricate the plutonium dioxide into MOX fuel. For each of the three types of facilities, the environmental impact statement analyzes four candidate sites, Hanford, Idaho, the Pantex Plant, and Savannah River.

In the U.S., DOE has the responsibility to manage, store, and dispose of weapons-grade fissile materials, such as plutonium. The overriding objective of the current plutonium disposition initiative is to reduce the worldwide threat of nuclear weapons proliferation. FETC is playing a part in the nonproliferation effort while expanding its traditional role of finding clean, environmentally sound ways to use the nation's abundant supply of fossil fuels 

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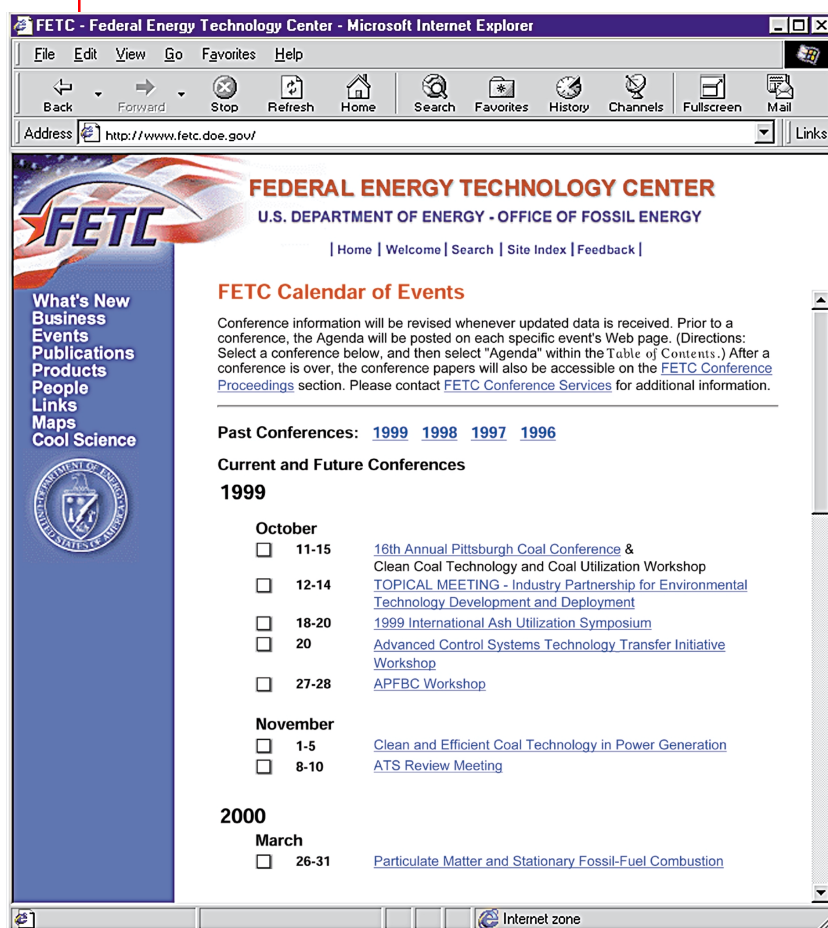
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calendar of events — **FETC online**



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1999 conferences on Future Fuels

- Electric Utilities Environmental Conference (January 11-13)
- Clean Cities Meetings (May 12-13)
- 1999 DOE Oil and Gas Conference (June 28-30)
- Joint DOE/EPRI/GRI Review Conference on Fuel Cell Technology (August 3-5)
- Workshop on New and Novel Fracture Stimulation Technologies for Gas Storage Wells (August 23-27)

Events lists all upcoming conferences, workshops, and symposia sponsored or co-sponsored by FETC. Each listing gives the dates, location, agenda, and registration information.

Publications lists past conferences, workshops, and symposia through 1996. Each listing is linked to available abstracts and proceedings publications.

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